

This assessment is based on a now-expired version of the achievement standard and may not accurately reflect the content and practice of external assessments developed for 2024 onwards. No part of the candidate's evidence in this exemplar material may be presented in an external assessment for the purpose of gaining an NZQA qualification or award.



Mana Tohu Mātauranga o Aotearoa
New Zealand Qualifications Authority

Level 1 Physics, Earth and Space Science RAS 2023

92046 Demonstrate understanding of the effect on the Earth of interactions between the Sun and the Earth-Moon system

EXEMPLAR

Achievement

TOTAL 10

PART ONE: LUNAR PHASES

We see different phases of the moon because the moon orbits the earth and as it does so we see the same surface of the moon with different amounts of lit area on the surface. As the moon travels between the sun and earth we see a new moon because the sun is hitting on the side of the moon turned away from us. As it travels around earth we start to see a part of the moon and into the first quarter. Then as it travels behind earth, now earth is between the moon and the sun we see a full moon. This is because the surface where we see is now facing the sun and can be lit by it. The moon keeps moving and the lit area from where we can see it becomes smaller and smaller until it becomes a new moon again. This whole process takes 29.5 days, because it is how long the moon takes to orbit the earth. The moon rotates its axis that stays on the same tilt once as it orbits the earth once, and we always see the nearside of the moon. The earth stays at a tilt all the time, however as the moon orbits, earth would be tilted differently towards the moon, away from it or at small differences in between. Therefore the moon would rise at different times each day because it would be around different areas of the earth's tilt. Also the moon moves east everyday and it would take the earth's rotation a little longer until it catches up and we can see the moon. So it would look like the moon rises a little later each day. If all the months were 29.5 days long, then on the same day each month the moon would rise at the same time.

PART TWO: TIDES

The moon has gravity that pulls on the earth, it creates tidal bulges on both sides of earth. The tidal bulge on the opposite side is caused because of the centrifugal force. At the same time the moon has gravity pull on the earth, the sun also does. When the moon and sun are lined the combined force is very large and causes a spring tide. When the moon and sun are at a 90 degree angle the combined force is weaker and this is a neap tide. The height of the daily tides change over a month because the moon is moving and the distance from the sun is different.

A king tide is a very large spring tide, it occurs when the moon is at a perigee where it is closest to earth. Spring tides and neap tides happen every 14-17 days because the moon is moving and the height of the wave depends on the position of the earth, moon and sun. We experience two high tides and two low tides everyday because of the rotation of the earth, and there are two high tides and two low tides caused by the moon's gravity and centrifugal force. As the earth rotates during a day we turn around once experiencing the low and high tides. New Zealand experiences king tides on irregular intervals of time because king tides are very rare and only happen when the moon is at a perigee and is inline with the sun, this is very hard to happen and because our latitude is slightly larger on earth so it happens at irregular intervals for us.

PART THREE: SEASONS

Some parts of the earth experience four seasons and some don't, Antarctica only has two seasons because it is either tilted away or towards the sun and doesn't have much difference in between. However New Zealand has four seasons because we have a smaller latitude and experience more tilt differences as we move around the sun and so New Zealand experiences sunlight all year round. As the earth orbits the sun its tilt stays 23.5 degrees all year round. We are in summer when we are tilted towards the sun and receive more direct sunlight and therefore have warmer temperatures. As our earth rotates and we are tilted away from it, receiving sunlight on a more tilted angle, the temperature is lower because the energy is spread across a larger area. This is when autumn comes for us. When we completely tilt away from the sun it is winter, as we keep moving around the sun we start to tilt back towards the sun and it is spring, when we completely turn towards the sun it becomes summer again.

The United Kingdom experiences the same four seasons at different times of the year compared to us because they are in the northern hemisphere, while we are in the southern hemisphere. This means when we are tilted towards the sun they are tilted away from the sun and therefore we experience different seasons at different times.

The earth had the same tilt all year round. The equator experiences little seasonal difference because as the earth rotates the sun they stay in the middle and don't experience much tilt difference when turning away or towards the sun, compared to New Zealand which has a larger latitude and experiences more tilt difference along the year.

Achievement

Subject: Physics, Earth and Space Science RAS

Standard: 92046

Total score: 10

Q	Grade score	Marker commentary
One	A3	Candidate has identified that Moon's orbit around the Earth causes phases, why new moon to new moon takes 29.5 days and positions of moon and sun for three phases of the moon.
Two	A3	Candidate has defined perigee and apogee as well as why spring and neap tides occur at 14–17 day intervals.
Three	A4	Candidate has described that the seasons are caused by Earth's tilt and orbit, temperature variation being smaller at the equator and that summer and winter occur at different times.